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DESCRIPTION AND LIFE-HISTORY OF A NEW RANA FROM WASHINGTON

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In the preparation of a comprehensive account of the Amphibia of Washington, I find it advisable to establish a new species and to record its life-history.

Rana cascadae sp. nov.

Description of Type.—Form moderately slender; head broad; external nares halfway between tip of muzzle and orbit; canthus rostralis prominent; orbit moderate; interorbital space about two-thirds length of orbit; moderate ridge on upper jaw, beginning anterior to the orbit and extending posteriorly to foreleg; tympanum inconspicuous, round, diameter about one-half length of orbit, separated from orbit by about two-thirds of its diameter; foreleg stout; palm with three elongated tubercles; sesamoid tubercles very prominent; digits stout, in order of decreasing length, 3, 4, 1, 2; dorso-lateral folds broad and prominent; hind leg slim; tibia nearly the same length as femur; tarsus greater than one-third length of foot; two metatarsal tubercles; toes stout, in order of decreasing length, 4, 3, 5, 2, 1; web moderate.

Tongue narrow oval, posterior end with well developed lobes, attached by anterior one-half to floor of mouth; internal nares slightly overlapped by upper jaw; vomerine teeth mostly posterior to line joining centers of internal nares, two areas of which converge posteriorly and nearly join; maxillary and vomerine teeth small.

Surfaces generally smooth with slight roughening on dorsal surface of body, posterior femur, and dorsal tibia.

General coloration dorsal surface slight greenish-brown with many black spots about three millimeters in diameter; dorso-lateral folds light brown; sides, green-brown mottled with black and fading to light yellow toward ventral surface; space behind eye including ear, and line under canthus rostralis, dark brown; ridge along upper jaw, yellowish; lips, mottled; throat and under-surfaces of body and limbs, very light yellow; upper surface fore limb, mottled and slight bar; hind limb with broken dark bands.

Type.—C. P. S. No. 2383, an adult female from Elysian Fields, Rainier National Park, Washington. Elevation 5700 feet. Collected by the author, June 19, 1938.

Paratypes.—Sixteen paratypes (C.P.S. 2384-2399) collected in the same place and on the same day by John W. Slipp and the author show variations in color and shape. The number of black spots on dorsal surfaces range from very few to about fifty. Individuals can change their ground color between the spots from gray-brown to nearly black. The tip of the muzzle in some is oval in outline from above while others have it nearly pointed. The type as pictured appears stouter than most of the paratypes because she was carrying mature eggs when captured.

MEASUREMENTS OF TYPE AND FIVE PARATYPES

C. P. S. No.	2383	2388	2387	2384	2386	2385
Sex	♀	♂	♀	♂	young	young
Head and Body Length	63.5	53.3	56.5	52.0	37.5	23.7
Length of Head	19.9	17.8	18.6	17.0	12.5	8.5
Width of Head	22.5	18.7	19.3	18.9	13.2	8.2
Orbit	7.0	5.6	5.1	5.4	3.5	2.7
Interorbital Space	4.1	3.4	4.1	2.9	2.8	2.5
Forearm	15.8	14.1	14.4	14.2	8.8	5.5
Hand	15.7	13.7	14.1	14.4	9.6	5.5
Femur	31.0	25.5	26.6	26.3	18.4	11.9
Tibia	35.0	27.3	30.6	28.0	19.7	11.6
Tarsus	18.4	15.3	15.3	14.9	10.5	6.0
Whole Foot	48.7	42.6	44.0	39.9	28.0	16.0

Range.—On life zones *Rana cascadæ* is typically a Hudsonian frog. I already have specimens in my collection from the higher parts of the following counties of the State of Washington: Chelan, Clallam, Kittitas, Lewis, Mason, Pierce, Skagit, Skamania, Snohomish, and Yakima; and one specimen from Potsville, Idaho. It will likely be found in Oregon, British Columbia, and possibly Alaska.

PLATE XIV

RANA CASCADAE sp. nov.

This is the only *Rana* which I find in the Hudsonian Zone of this state. *Rana aurora aurora* and *Rana cascadæ* overlap a little in distribution in the Canadian Zone.

Eggs.—The different jelly envelopes average as follows: outer 11.3, middle 5.8, inner 4.9, while the egg proper is 2.25. Color of egg is very dark on upper three-fourths and light cream below.

Tadpoles.—The teeth are in two upper rows with a small gap in center of second row and four lower, three of which are nearly full length while the fourth is about one-fourth the length of the others. Tadpoles at hindlimb bud stage are 34 millimeters and when the toe buds show on hind limb they are about 40 millimeters.

Life-history.—Spawning period is from May 20 to July 10 depending on how much snow there is to melt before the ponds appear; eggs deposited in small ponds in numbers up to 425 by single female, hatch in 8 to 20 days; larval period 80 to 95 days, with very few tadpoles living over to following summer; transformation size for most of them 14 mm. or less; size at one year after transforming about 30 mm.; sexual maturity reached at end of three full years or possibly four.

Remarks.—Some previous collectors have placed specimens of this species with *Rana aurora aurora* while others have called them *Rana pretiosa* but it appears to me that *Rana cascadæ* may be more primitive than these other two species. This species is named from the region in which I first found it which is the Cascade Range.

NOTES ON THE NEWT *TRITURUS VIRIDESCENS*

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Accounts of the life history of *Triturus viridescens viridescens* (Rafinesque) indicate that the duration of the terrestrial red eft stage may vary in different localities. Pope (1924) estimates that it lasts three and a half or four years, while Noble (1926 and 1929) reports a complete absence of this stage in newts on Long Island and in the Woods Hole region. Hausman (1936) reports keeping a red eft in a glass-covered terrarium for seven years without any indication of its changing to the aquatic form.

Adult newts were collected in Leake's Pond, Williamstown, Massachusetts, and sexually activated by injections of whole pituitary extract of sheep. Fertilized eggs hatched about twenty days after having been laid. The larvae remained aquatic about three months at which time they metamorphosed into the terrestrial eft stage with characteristic reddish skin and obliteration of gills. One individual, kept at room temperature in a glass-covered aquarium provided with beach and pool, remained in the terrestrial stage for two years. During this interval it rarely entered the water, and then for only a few minutes at a time. Although its skin never acquired the brilliance found in animals in their natural haunts, it was otherwise like that of the typical red eft. The lack of brilliance may have been due to the restricted diet of mealworm larvae and enchytraeid worms, or to the somewhat abnormal environment provided by the aquarium. For several months an increasing sluggishness accompanied by paralysis of the front legs preceded death. At the time of death the length was 47 mm., most of the growth having taken place during the first year.

Although autumnal courtship and deposition of spermatophores in *Triturus viridescens* were first described by Gage in 1891, no reports have been made, so far as I know, of eggs being laid and larvae developing at this season. Newts which had been collected in Williamstown were observed in the fall of 1935 snapping at eggs adhering to leaves of Elodea in a balanced acquarium kept at room temperature in the laboratory. Several of these eggs escaped destruction and hatched out into larvae. The newts had been fed weekly with fresh liver, but had had no other attention since their capture.

LITERATURE CITED

GAGE, S. H.

1891 Life history of the vermillion-spotted newt (Diemyctylus viridescens). Am. Nat., 25: 1048-1110.

HAUSMAN, SIBYL A.

1936 The spotted newt. Turtox News, 14: 94.

NOBLE, G. K.

1926 The Long Island newt; a contribution to the life history of Triturus viridescens. Amer. Mus. Nov., No. 228.

1929 Further observations on the life-history of the newt, Triturus viridescens. Amer. Mus. Nov., No. 348.

POPE, PHILIP H.

1924 The life-history of the common water-newt (Notophthalmus viridescens), together with observations on the sense of smell. Annals Carnegie Mus., 15: 305-368.

DESERT REPTILES IN LASSEN CO., CALIFORNIA

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Many desert species which occur in Owens Valley, Inyo County, California, are absent to the northward along the eastern border of this State, where high zonal conditions prevail (in Mono, Alpine, Eldorado, Placer, Nevada, and Sierra counties), but some of them reappear on the eastern border of California some 250 miles farther north, in southeastern Lassen County. Such forms generally have continuous distributions from Owens Valley north across the lowlands of west-central Nevada to the Pyramid Lake region where they again appear across the state line as indicated.

Three species of reptiles not previously recorded from the northeastern part of the state were found by me in this part of Lassen County in May, 1936 and 1937. These were: *Phrynosoma platyrhinos* (from Warm Springs, also seen in vicinity of state line on Nevada side at Smoke Creek); *Crotaphytus collaris baileyi* (south fork of Smoke Creek and ten miles north of Wendel); and *Rhinocheilus lecontei* (six miles north of Litchfield). On the same trips other desert reptiles, though previously recorded from Lassen County, were found at the following localities.

DOYLE AND WARM SPRINGS

Crotaphytus wislizenii
Coluber taeniatus taeniatus
Pituophis catenifer deserticola

SECRET VALLEY

Uta stansburiana stansburiana

SMOKE CREEK

Crotaphytus wislizenii
Uta stansburiana stansburiana
Sceloporus graciosus graciosus
Cnemidophorus tesselatus tesselatus
Coluber taeniatus taeniatus
Pituophis catenifer deserticola

The specimens of *Sceloporus graciosus* are referred to the race *graciosus* because they have a distinctly striped pattern, thus resembling Nevada material, but differing strikingly from *S. g. gracilis* of the Sierra Nevada and coast ranges.

Of these species, *Sceloporus graciosus, Cnemidophorus tesselatus, Pituophis catenifer, Coluber taeniatus,* and *Rhinocheilus lecontei* occur also in northern California west of the Sierra-Cascade divide, but except for the two last named, are there represented by different subspecies. Grinnell, Dixon, and Linsdale (Univ. Calif. Publ.

Zool., vol. 35, 1930, p. 102-105) list numerous species of birds and mammals which likewise have differentiated into races distinct in the Sacramento River drainage from races on the Great Basin side of the mountains.

The arid, sage-covered terrain of the localities where desert reptiles were collected in Lassen County provided the habitats of all these species characteristic farther south. Where collared lizards were hunted ten miles north of Wendel, golden-mantled ground squirrels sought shelter in the same rock piles, an unexpected association of this Boreal mammal with the Austral *Crotaphytus*.

LEPTODEIRA IN NORTHERN CALIFORNIA

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The spotted night snake, *Leptodeira torquata ochrorhyncha*, is typically a desert species which has been found from central Mexico and Texas to Lower California, and north into southern Idaho. The material now available demonstrates that the species also ranges widely in central and northern California west of the Sierran divide.

The only published records north and west of the Tehachapi Mountains region in California are of specimens from Christie, Contra Costa County, and Los Gatos, Santa Clara County (Van Denburgh, 1922, Occ. Papers Calif. Acad. Sci., 10:783). There are in the Museum of Vertebrate Zoology four from Sequoia National Park, Tulare County, at about 4000 feet altitude on the west flank of the southern Sierra Nevada, and there is one from Mission San Jose, Alameda County.

Two specimens recently collected extend the known range far to the northward, in northern California. One of these I found dead on the Red Bluff - Susanville highway along Paine's Creek about five miles east of Dales, Tehama County, on May 24, 1936; the other was found six miles east of Oroville, Butte County, May 9, 1937. These two localities are more than sixty miles apart, both in rocky areas in open woods of the blue oak and digger pine belt. As this foothill belt extends around the Sacramento Valley on the north, offering nearly uniform habitat conditions throughout, the night snake likely ranges around the north end of the valley and perhaps down the west side. Probably its distribution roughly parallels that of other

typically desert-inhabiting forms, the road-runner and the whip-tail lizard, as they occur west of the Sierran divide.

I follow Dunn (1936, Proc. Nat. Acad. Sci., 22: 689-698) in applying the name *Leptodeira torquata* to the night snake, which is better known as *Hypsiglena ochrorhynchus*.

FOOD HABITS OF THE CHUCKWALLA, *SAUROMALUS OBESUS*.

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During April 1938 the writer collected twelve chuckwallas in order to make a study of the food habits of this species. Specimens were collected in creosote bush and ocotillo associations at Borego Mountain, Tubbs Canyon, and Palm Canyon in San Diego County, California.

Stomachs of the Borego Mountain specimens contained stems and leaves of *Phacelia* sp.; leaves, stems and blossoms of *Franseria dumosa;* leaves of *Encelia farinosa;* leaves and a seedling of *Eriogonum* sp.; leaves of *Ditaxis lanceolata;* blossoms and leaves of *Larrea divaricata;* and the blossoms of *Fouquieria splendens* which the lizards had picked up around the bases of these plants. Sand was also found in the stomachs which contained the *Fouquieria* blossoms. Specimens from Borego Mountain seemed to prefer the leaves and stems of *Franseria dumosa* as their stomachs were filled largely with the leaves and stems of this plant.

The stomachs of the 8 specimens from Tubbs Canyon contained leaves of *Encelia farinosa;* leaves, seed-pods and stems of *Lotus* sp.; leaves of *Phacelia* sp.; seedling of *Festuca* sp.; blossoms, leaves and stems of *Crpptantha* sp.; and the blossoms, leaves and stems of *Lotus strigosus.* These specimens showed equal taste for *F. dumosa* and *E. farinosa.*

The single specimen collected at Palm Canyon contained several large blossoms, about 10 x 15 mm. when pressed, of *Chænactis* sp.; one blossom of *Salvia columbariæ;* leaves, stems and blossoms of *Cryptantha* sp.; and the blossoms of *Tropidocarpum gracile.*

No animal remains were found in any of the stomachs.

I am grateful to Mr. Frank F. Gander of the San Diego Natural History Museum for assistance in the identification of the plant material.

PLETHODON DUNNI IN OREGON AND WASHINGTON

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Department of Biology, College of Puget Sound

Dr. S. C. Bishop described *Plethodon dunni* (P. Biol. Soc. Wash., 47: 169-172) from specimens collected by Stanley G. Jewett, Jr. at Eagle Creek, Clackamas County, Oregon; Jewett (Copeia, 1936:71) does not extend the range beyond that county, so it is thought desirable to report on some specimens collected this spring. On March 21, 1937 we collected a few specimens of this species very close to a small stream at the highway crossing 4.4 miles southeast of Grays River (village), Wahkiakum County, (C. P. S. No. 1932); and near the base of a falls 1 mile east of Oak Point, Cowlitz County, (C. P. S. No. 1843, 1918-1920). At both of these stations we also obtained *Rhyacotriton olympicus, Dicamptodon ensatus* larvae, and *Plethodon vehiculus,* besides *Triturus torosus* at the first station and *Rana aurora aurora* at the second.

On May 1, 1937 Mr. Murray Johnson, a student of mine, collected amphibians in a gulch just below the Medical School at Portland, Multnomah County, Oregon, and two of the specimens (C. P. S. No. 1970-1971) presented to me are *Plethodon dunni.* Specimen No. 1970 is 130 mm. in length and contains 18 light cream colored eggs about 2 mm. in diameter and many smaller ones.

This extends the known range of this salamander 80 miles down the Columbia River from Portland and adds three counties to its distribution.

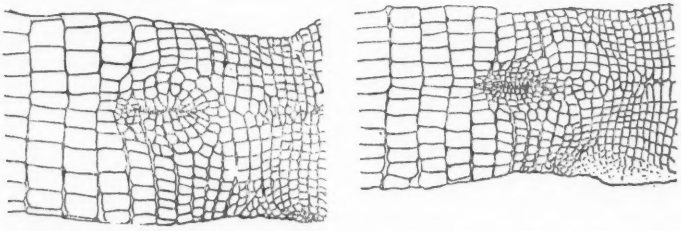
EXTERNAL SEXUAL DIFFERENCES IN THE ALLIGATOR, *ALLIGATOR MISSISSIPIENSIS*

PERCY VIOSCA, Jr.
Southern Biological Supply Company, Inc., New Orleans

For a number of years the Southern Biological Supply Company has been called upon to supply live animals of known sex of various species of which the sexes are not generally known to be distinguishable by external criteria. This has necessitated close observation, sometimes of large numbers, and has resulted in several interesting discoveries. One paper, on sex differentiation in *Pseudemy troostii*

(Copeia, 1933: 208-210) has been published as a result of these scattered observations and this is the second.

To determine the sex of a live alligator our earlier procedure was to lay the animal, belly upward on a bended knee, pressing on both sides of the vent with the thumbs and bending the tail downward at the same time. In most cases, if a male, the penis would protrude. This method was not infallible, however, especially with very young specimens, and entailed some danger in case of large specimens if sufficient assistance was not at hand.



Tracings from photographs of alligator skins showing scutellation in the region of the vent. Left, a 97-inch hide of a male; right, an 87-inch hide of a female.

Closer observation of both sexes disclosed a difference in the partly opened cloaca and, later, external differences in the scutellation around the vent. The accompanying illustration shows that in the male, the scutes on each side of the vent are in three fairly definite rows, with rudiments of a fourth lining the vent. In the female there are four fairly definite rows on either side with rudiments of a fifth lining the vent. There are, however irregularities in both sexes in this regard.

It will also be noted that in the case of the male, the scutes referred to are larger, more often sub-triangular, and more plate-like; whereas in the female they are smaller, more rounded, and beadlike. There are also differences in the scutellation just anterior and posterior to the vent, but these have not been studied in a sufficiently large series to determine their value.

As the animals approach maturity, other secondary sexual characters become obvious, notably the physiognomy of the head, which difference is similar to that exhibited by mammals, the jaw being more massive in the male, and the aspect of both sexes suggestive of that in the corresponding sex of the dog.

NOTES ON THE ARUBA RATTLESNAKE, *CROTALUS UNICOLOR*

CARL F. KAUFFELD and HOWARD K. GLOYD
Staten Island Zoological Society and The Chicago Academy of Sciences

An adult pair of rattlesnakes (*Crotalus unicolor* Van Lidth de Jeude) from Aruba Island, Dutch West Indies, collected by Captain R. J. Beaujohn, was received by the Staten Island Zoological Society on April 17, 1937. Both snakes were in excellent condition; no skin blemishes, scars or parasites could be found, and the female was obviously gravid.

From the very first, these snakes were relatively quiet in behavior and it was difficult to provoke them enough to make them rattle. The female, however, was noticeably more excitable than the male.

The male fed upon a white mouse soon after arrival and accepted food whenever it was offered, which was about every ten days. One full-grown white mouse seemed sufficient to satisfy his hunger. As a rule his method of killing food did not differ from that of other rattlesnakes, although occasionally he would pursue the mouse around the cage instead of waiting for it to come within striking range. The venom acted very rapidly, death of the mouse invariably following in less than a minute after the bite. Further indication of his good health was the shedding of his skin, all in one piece, early in July. Despite his quiet acceptance of captivity and excellent appetite, he died on July 31, apparently of a lung infection.

The female steadfastly refused food througout the period of her captivity. This occasioned no special concern for sometimes gestating snakes show little interest in food.

During the evening of July 7, five young were born. They were either dead at birth or died soon after. The fact that the penes of the males were still everted suggests that parturition was premature. These organs develop externally but normally are drawn into the sheaths beneath the ventral skin of the tail before birth or immediately afterward. The female died that night and was found to have seven more young in the uteri. Since the young had no obvious abnormalities and the female seemed to be in good health, the reason for this casualty is not apparent.

Data from these fourteen specimens confirm the validity of this species and supplement the description published in an earlier number of this journal (1:65-68). Both adults have only a faint trace of

PLATE XV

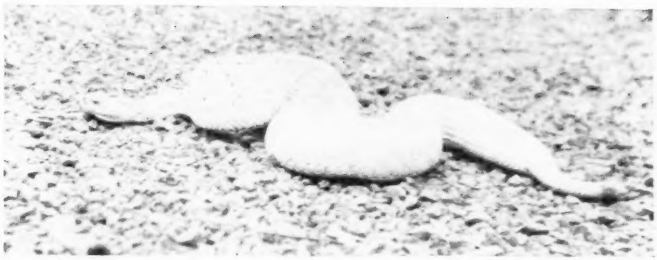


Fig. 1. Adult female *Crotalus unicolor* from Aruba Island, 1937.

Fig. 2. Adult males of *Crotalus unicolor* and *C. d. durissus*.

Photographs, Staten Island Zoological Society

pattern (Plate 15). In the male the blotches are too indistinct to be counted even when the preserved specimen is held under water. In the female about 25 rhombic blotches on the body and three or four very indistinct crossbands on the tail can be seen (Fig. 1). There is no pattern on the head of either. The ground color is a pale gray with fine stippling and flecking of darker gray, giving a "dusty" appearance to the whole snake. The ventral surface is immaculate but there is a faint tinge of pink on the sides.

In the young, as one would expect, the pattern is more conspicuous. Dark pigment occurs on the head in all and, in some, traces of a frontal crossbar and cheek stripe are found. Paravertebral stripes from one to three times the length of the head occur in seven specimens. The dorsal blotches of the body are fairly conspicuous, dark gray in color, and rhombic in shape; they range from 18 to 24 in number. Four or five bands on the tail can be distinguished in three individuals; in the remainder of the brood the tail is only slightly darker than the ground color of the body.

Structurally these specimens are very similar to those previously described. Their scutellation and measurements are as follows: (1) adult male, scale rows 27-27-19; ventrals 159; caudals 28, the last divided; supralabials 13-13; infralabials 13-14; first infralabials divided on right side; internasals 2; canthals 1-1; scales before supraoculars 4; loreals 2-3; preoculars 2-2; postoculars 3-3; total length 695 mm.; tail length 70 mm.; ratio of tail to total length .101; rattle 7 plus, all segments of about equal size; (2) adult female, scale rows 27-27-20; ventrals 167; caudals 23, the last divided; supralabials 13-14; infralabials 14-14; first infralabials divided on right side; internasals 2; canthals 2-2; scales before supraoculars 6; loreals 2-2; preoculars 2-2; postoculars 4-4; total length 758 mm.; tail length 53 mm.; ratio of tail to total length .070; rattle 7 plus, the proximal 3 or 4 segments about equal in size, the distal ones tapering.

The spinal ridge characteristic of the majority of specimens of neotropical rattlesnakes is very inconspicuous in these. It is most obvious in the adult female, and can be traced in the male, but in the young is scarcely perceptible.

In all fundamental respects the young are similar to the adults. The scale rows are 25(27)-27(25)-19(17-21); ventrals 7 males 155-160, 5 females 163-166; caudals 7 males 28-31, 5 females 23-24; supralabials 11-14, usually 12 or 13; infralabials 12-14, usually 13 or 14;

loreals 1-3, usually 1; canthals 1 or 2; preoculars 2; postoculars 2-5 usually 4.

The condition of the young, and especially of those removed from the uteri after death of the female, in most cases does not permit a satisfactory measurement. One male, however, is 201 mm. in total length, tail length 21 mm.; three females range from 187 to 205 mm. in total length and from 15-16 mm. in length of tail.

The differences between this species and *C. d. durissus* are strikingly indicated in Fig. 2, in which an adult male of each is shown. The possibility that the Aruba specimens are aberrant *durissus* no longer seems plausible. The loss of pattern in adults, as well as the small size and other differences, in the opinion of the writers, may be interpreted as modifications from a more generalized stock, fostered by insular isolation.

A SUPPLEMENTARY NOTE ON THE LARVAE OF *BUFO WOODHOUSII WOODHOUSII*

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The larvæ of *Bufo woodhousii woodhousii* (Girard) have been described previously by Youngstrom and Smith (1936). With this in mind, the author is submitting this paper as a suplementary account to what has already been published on the subject.

The material for this study was collected in the vicinity of Norman, Oklahoma during the springs of 1936 and 1937. Observations on the eggs and developing larvæ were in accord with those of Smith (1934), and Youngstrom and Smith (1936). Cleavage is fairly rapid—about seven and one-half hours elapse from the time of laying until the blastula stage; about fifteen hours until gastrulation, and about twenty-eight hours until the closure of the neural tube. The embryos are able to turn around in the tube by ciliary action when approximately thirty hours old. When the larvæ are about three days old they begin to swim in spirals, and continue to swim

PLATE XVI

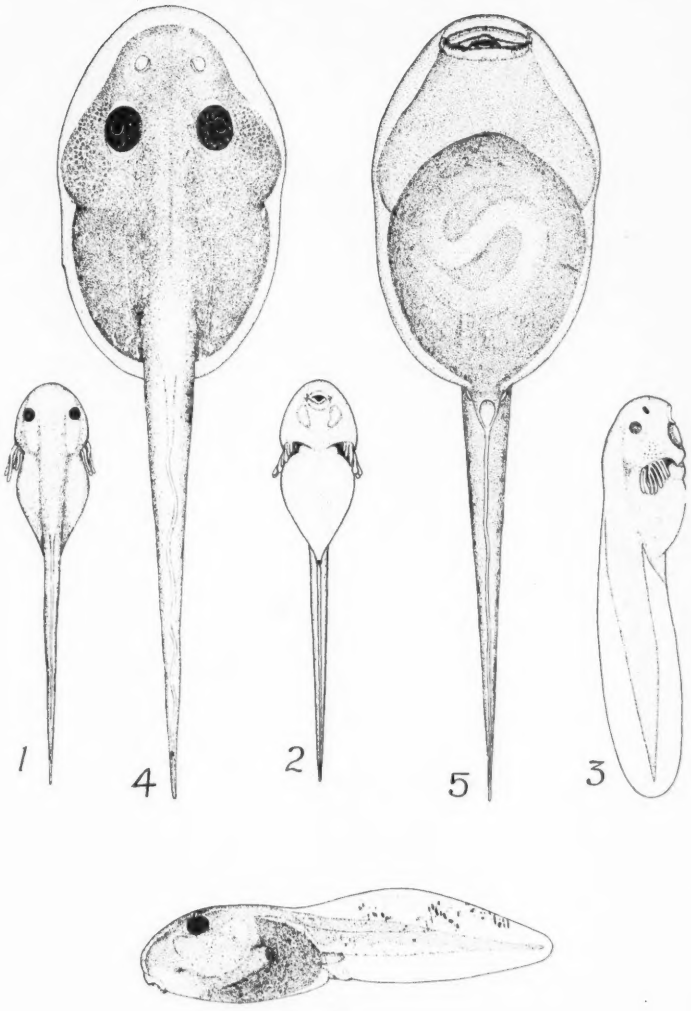

Fig. 1-3. Dorsal, ventral, and lateral views of 6.6 mm. tadpole; 98 hours after fertilization.

Fig. 4-5. Dorsal and ventral view of 11.5 mm. tadpole; 10 days after fertilization.

Fig. 6. Lateral view of 16.4 mm. tadpole; 33 days after fertilization.

in this manner for thirty or forty hours. A discussion of these activities with reference to *Bufo cognatus* has been prepared by Bragg (1936).

Larvæ 6 to 7 mm. in length are black dorsally, laterally, and throughout the musculature of the tail. The color of the ventral surface of thebody fades into a lighter gray. A group of small dark spots is noticeable on the sides of the head, between the eyes and the gills. The external gills, which have developed from two small bumps on either side of the head, now have many branches and occur in double rows. Figures 1, 2 and 3, drawn from a typical 6.6 mm. larva, illustrate the points just mentioned as well as the characteristics previously described.

When the larvæ of *B. w. woodhousii* are 7 to 8 mm. in length, a change of color is noticeable from a dark gray to a lighter shade with small golden maculations. There are also changes in form, assuming the characteristic form of the larvæ of *B. w. woodhousii* (Youngstrom and Smith, 1936). These transformations in color and form continue until the larvæ are from 10 to 11 mm. in length, when the color pattern as well as the form and mouth parts become definate (Fig. 4 and 5). Dorsally, the basic color of the trunk is gray. On the head there are somewhat lighter areas. The chromatophores are quite distinct on the sides of the head (Fig. 4). A rather deep gray stripe is faintly visible on the mid-dorsal line, but this fades out as it approaches the base of the tail, where the basic color is noticeably lighter. The golden specks characteristic of the earlier embryos are larger and very irregular in shape. They are grouped in certain areas which are consistent on all the larvæ, with variations only in the number of spots or size of the areas. In figures 4 and 5 these golden spots are indicated in white. They extend from a point adjacent to the medial margin of the eyes posteriorly to the tail and along the dorsal muscular portion of the tail. They occur sparingly, if at all, on the mid-dorsal surface, except near the base of the tail, where they often extend over its mid-dorsal line. They tend to be more numerous in the gill region, and at the posterior end of the body on either side of the tail base. Along the sides of the head and body the spots may be scattered irregularly. The black surface of the eyes is specked with gold and the pupal rim is golden.

Faint lateral lines extend from the region of the gills posteriorly into the tail. In the tail they are much clearer and extend in a

diagonal direction to the dorsal part of the muscular portion (Figs. 4 and 6).

The coloring on the ventral side of the tadpoles is divided into dark gray or black over the abdomen and light gray on the head. The juncture is very distinct between the coloring of the abdomen and that of the head (Fig. 5). The intestine is visible in the central part of the abdomen. Silvery spots are scattered over the ventral surface.

Further development to 16 and 17 mm. in length is not accompanied by appreciable changes in the general appearance of the larvæ. They become a little lighter in color because of an increase in number of the golden spots, but the pattern remains the same. The background remains gray as in earlier stages of tadpole development. The ventral side also appears unchanged. The abdomen is characterized by a very dark background, except in the central part where the intestine is visible. On the head the coloring is light gray.

Figures 4, 5 and 6 illustrate the general appearance of the larvæ as described by Youngstrom and Smith (1936, pp. 630-630). Since this study of the body measurements is in agreement with that of the above authors *(ibid,* p. 131), there is no use in reprinting this information.

LITERATURE CITED

BRAGG, A. N.

1936. Notes on the breeding habits, eggs, and embryos of *Bufo cognatus* with a description of the tadpole. Copeia 1936: 14-20.

1937. Observations on *Bufo cognatus* with special reference to breeding habits and eggs. Amer. Midl. Nat. 18:273-284.

SMITH, HOBART M.

1934. The amphibians of Kansas. Amer. Midl. Nat. 15:377-528.

WRIGHT, ANNA A. and A. H. WRIGHT

1933. Handbook of frogs and toads. Comstock Publishing Co., Ithaca, N. Y.

WRIGHT, A. H.

1929. Synopsis and description of North American tadpoles. Proc. U. S. Nat. Mus. 74:1-70.

YOUNGSTROM, KARL A. and HOBART M. SMITH

1936. Description of the larvæ of *Pseudacris triseriata* and *Bufo woodhousii woodhousii* (Anura). Amer. Midl. Nat. 17:629-633.

THE AMPHIBIANS AND REPTILES OF UNION COUNTY, PENNSYLVANIA

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Union County is situated in east central Pennsylvania between the parallels of 41° 5′ 26″ and 40° 8′ North latitude and the meridians of 76° 47′ 38″ and 77° 21′ West longitude. With the greatest length 24 miles and the greatest width 18 miles the total area is 305 square miles. Elevation varies from 430 feet to 2100 feet above sea level. Union County is bounded on the north by Lycoming County, separated on the east from Northumberland by the Susquehanna River, bounded on the south by Snyder, and on the west by Mifflin, Center, and Clinton Counties. The major streams in the county are White Deer Creek, Buffalo Creek, and Penn's Creek which flow eastward into the Susquehanna River. Surface rocks consist of sandstone, red and variegated shales, and limestone.

Of the thirty-three forms of amphibians and forty forms of reptiles that have been recorded from Pennsylvania, twenty-four amphibians and twenty-two reptiles are known to occur in Union County. Specimens of each species of amphibians and reptiles are included in my private collection. Additional specimens and records are possessed by the Zoology Department of Bucknell University in Lewisburg, Pennsylvania.

Cryptobranchus alleganiensis Daudin. Hellbender. Found in the Susquehanna River, Buffalo Creek, and Penn's Creek where it is occasionally taken by fishermen. Two specimens were taken from the mouth of Buffalo Creek on September 2, 1937.

Triturus viridescens viridescens Rafinesque. Red-spotted Newt. common throughout the county in pools and brackish water. Red land phase frequently seen at White Deer Dam.

Ambystoma jeffersonianum Green. Jefferson's Salamander. Found in spring ponds at Old Gap and Hairy John's Spring. Two specimens taken at Old Gap on March 21, 1936.

Ambystoma maculatum Shaw. Spotted Salamander. Found in western and northern portions of county. Breeding often begins before ice has left the pond. Several specimens taken near Old Gap on March 15, 1936 were breeding.

Ambystoma opacum Gravenhorst. Marbled Salamander. Frequent in several localized spots in county. Specimens collected on Sand Mountain. A September 23 record notes eggs already quite progressed in developed embryos. Observation of 31 nests recorded egg complements of from 27 to 63 eggs.

Gyrinophilus porphyriticus porphyriticus Green. Purple Salamander. Found in springs and cold mountain pools throughout county. Frequent large specimens taken from Hickornell Spring about a mile from Laurelton.

Pseudotriton ruber ruber Sonnini. Common Red Salamander. Specimens collected at White Deer, White Deer Dam, and Hickornell Spring. Reports of this species seen traveling over the snow during winter months. Seven adult specimens under one rock at Hickornell Spring recorded by Dr. Stewart.

Eurycea bislineata bislineata Green. Two-lined Salamander. Abundant in low woods where it is found under rotting logs. Specimens taken in woods along Turtle Creek and at White Deer.

Eurycea longicauda Green. Long-tailed Salamander. Abundant along streams near White Deer. Six specimens taken under rotted wood of log bridge in ravine near White Deer.

Plethodon cinereus Green. Red-backed Salamander. Common throughout county. Found under stones, decaying logs, and leaves. Specimens collected in woods along Turtle Creek.

Plethodon glutinosus Green. Slimy Salamander. Found throughout county. Common in White Deer Valley in locations similar to those of *Eurycea longicauda*. Specimens also taken in lowlands of Shamokin Mountains.

Hemidactylium scutatum Schlegel. Four-toed Salamander. This species occurs in meadows near Hairy John's Spring and at White Deer Dam. Egg complements ranging from 12 to 50 eggs recorded from observation of 47 nests. Breeds through April.

Desmognathus fuscus fuscus Rafinesque. Dusky Salamander. Found throughout the county in most small streams. Egg complements 22 to 34 eggs recorded from 44 counts at White Deer Dam. A record of September 23 notes eggs well along in embryonic development.

Desmognathus fuscus ochrophaeus Cope. Mountain Salamander. Found in streams at higher altitudes than *fuscus* on South White Deer Ridge, Nittany Mountain, and Buffalo Mountain.

Bufo americanus americanus Holbrook. American Toad. Common along the Susquehanna River and lowlands of Union County. Breeds from mid-May until June. A date record from Eagles Mere Lake, (Lycoming Co.) notes egg laying on June 16.

Bufo woodhousii fowleri Holbrook. American Toad. Common along the Susquehanna River, Penn's Creek, and Buffalo Creek. More common apparently than *americanus*.

Pseudacris nigrita feriarum Baird. Baird's Chorus Frog. Found in localized spots throughout county. Specimens collected near Laurelton together with several-day-old tadpoles on April 27, 1936. Records from near Laurelton, Forrest Hill, and Allenwood on April 15, 1937 by Dr. Francis Harper.

Hyla crucifer Wied. Spring Peeper. Common throughout county. Breeding begins about mid-March.

Hyla versicolor versicolor Le Conte. Common Tree Frog. Found at various points along Penn's Creek, Buffalo Creek, White Deer Creek, and along the Susquehanna River. Breeds through May.

Rana catesbeiana Shaw. Bullfrog. Common along Susquehanna River and mouths of creeks entering river. Specimens collected at Shriner's Island on July 16 and at Hairy John's on July 21 at time of breeding. From a count of 12 egg masses the egg complement was from 800 to 1000.

Rana clamitans Latreille. Green Frog. Common along streams and in ponds throughout county. Specimens taken near Turtleville and Lewisburg. Breeds from mid-April through May.

Rana palustris Le Conte. Pickerel Frog. Found in meadows along streams throughout county. Two specimens collected in spring near Turtleville.

Rana pipiens Schreber. Leopard Frog. Abundant near White Deer Dam and common in meadows and ponds throughout county. Breeds during the first part of April.

Rana sylvatica Le Conte. Wood Frog. Common at White Deer Dam where it breeds about March 25. Egg masses are often very large with a diameter of 3 ½ feet and 1 foot in depth.

Chelydra serpentina L. Snapping Turtle. Found along Penn's Creek and Buffalo Creek. Specimens taken at White Deer Dam where they lay eggs in a sand bank along the stream.

Clemmys guttata Schneider. Spotted Turtle. Common along Susquehanna River, Penn's Creek, and Buffalo Creek. Found in ponds throughout county.

Clemmys insculpta Le Conte. Wood Turtle. Occasional specimens are found throughout county. Specimen taken near White Deer Dam on June 3, 1937 laid eight eggs from July 9 to July 28.

Emys blandingii Holbrook. Blanding's Turtle. Several specimens have been picked up in the county. There is the possibility that these are releases.

Terrapene carolina L. Box Turtle. Frequently found on Shamokin Mountain, Buffalo Mountain, Nittany Mountain, and South White Deer Ridge.

Chrysemys picta Schneider. Eastern Painted Turtle. Common along Susquehanna River, Penn's Creek, Turtle Creek, and Buffalo Creek. The most common turtle in this county.

Sceloporus undulatus undulatus Latreille. Fence Lizard. Common locally. Two specimens collected in pine woods on Shamokin Mountain near Turtleville laid eggs in laboratory terrarium on July 3 and 7 in complements of 9 and 11 eggs respectively. Dr. Stewart of Bucknell University has a record of one laying 16 eggs on July 13, 1937. Length of 7 specimens ranged from 80 mm. to 165 mm.

Eumeces fasciatus L. Blue-tailed Skink. Found at White Deer Dam and at Old Gap around rock piles and logs. The length of five specimens from White Deer Dam ranges from 147 mm. to 159 mm.

Diadophis punctatus edwardsii Merrem. Ring-necked Snake. Found near shale diggings along upper reaches of White Deer Creek. Two specimens taken near White Deer Dam.

Heterodon contortrix L. Hog-nosed Snake. Specimen taken in field near Laurelton. Also observed on Shamokin Mountain and Sand Mountain.

Opheodrys vernalis Harlan. Grass Snake, Smooth Green Snake. Apparently common throughout county as it is frequently reported by huckelberry pickers. Two specimens taken on Buffalo Mountain.

Opheodrys aestivus L. Rough Green Snake. Specimen collected along Turtle Creek near Turtleville.

Coluber constrictor constrictor L. Black Racer. Found in the hills throughout entire county. Two specimens with eggs collected on sawdust heap near White Deer.

Elaphe obsoleta obsoleta Say. Pilot Black Snake. Common in hills and mountain valleys throughout county. Specimens collected near Turtleville.

Lampropeltis triangulum triangulum Lacepede. Milk Snake. Fairly common in lowlands of county. Specimens observed and collected throughout county.

Natrix sipedon sipedon L. Banded Water Snake. Common in lowlands along Penn's Creek, Buffalo and Little Buffalo Creek, and Turtle Creek.

Storeria dekayi Holbrook. De Kay's Snake. Found near White Deer Dam and along Turtle Creek. Specimens collected in loose shale near Turtleville.

Storeria occipito-maculata Storer. Red-bellied Snake. Occasional specimens observed in mountain valleys throughout county. Two specimens taken near White Deer Dam.

Thamnophis sauritus sauritus L. Ribbon Snake. Common in swampy meadows throughout county. Specimens taken near Weikert and Laurelton.

Thamnophis sirtalis sirtalis L. Common Garter Snake. Abundant throughout county. Specimens have been collected in almost every portion of county although usually in lowlands.

Agkistrodon mokasen mokasen Beauvois. Copperhead. Common in mountains of county and frequently observed in lowlands along mountain streams. Specimens collected on Sand Mountain and Shamokin Mountain.

Crotalus horridus horridus L. Banded Rattlesnake. Common in mountains of county and particularly abundant on Sand Mountain and Buffalo Mountain where it lives in the many rock heaps.

Another species, *Scaphiopus holbrookii holbrookii* Harlan, which has not yet been collected in Union County is known to occur in Northumberland County and should be added to the Union County list upon further search. *Clemmys muhlenbergii* Schoepff, has been picked up in Union County but is probably a release.

The author wishes to thank Dr. Francis Harper of the Academy of Natural Sciences of Philadelphia for critical examination of this manuscript and Dr. Norman Stewart of the Bucknell University Zoology Department for additional notes.

BOOK REVIEWS

A GUIDE TO THE SNAKES OF UGANDA. By Charles R. S. Pitman, Uganda Society, Kampala, Uganda. 1938. xxi, 362 pages; 41 plates, 23 colored, 2 maps. $7.50.

A popular account, written by an amateur, who has been in Uganda seventeen years and knows most of the species from field experience. Fifty-nine pages, largely filled with "Oh my!" statements of general interest, introduce the main treatment of seventy-eight species of Uganda snakes. The treatment includes native names, distribution, description, and habits and excellent color plates showing head, ventral and side views. The author has used the English literature on Uganda snakes freely, and has given full credit to all workers

whom he quotes! The color plates are of exceptional quality, both as to original draftsmanship and final color work — they should be seen by everyone contemplating publication in this country where no book on snakes which is well illustrated in color has appeared for nearly a century! Would that we had some amateurs like Captain Pitman!

WHAT SNAKE IS THAT? By Roger Conant and William Bridges. D. Appleton-Century Co. 1939. viii, 63 pages, 35 plates. $2.00.

A book which I fear professional herpetologists will shake their heads at—at first. Conant and Bridges have tried to adapt a popular style of "guide" so well known for birds and flowers to a subject hitherto either shrouded in technical terms which scares away the "nature lover" type, or else devoid of all semblence of scientific form. That they have succeeded can easily be shown by submitting the key to a class with no previous experience.

Scientific names in key and illustrations would have been appreciated by the advanced student, but his primary, if not exclusive, use of the book will be the descriptions of the 132 eastern species treated. Mr. Conant's extensive field experience with the habits and young of snakes has made it possible to include in the discussions of each species much information not available within the covers of any other book and therefore this little volume is particularly indispensable to all interested in North American snakes.

A CHECK LIST OF NORTH AMERICAN AMPHIBIANS AND REPTILES. By Leonhard Stejneger and Thomas Barbour. Fourth Edition. Harvard University Press. 1939. xvi, 207 pages. $4.00.

The new check list enumerates 493 species including 687 forms—deleting seventeen names and adding ninety-one to the third edition There have been nomenclatorial changes within the genera, affecting sixty-three names. The only generic changes are the inclusion of *Liopeltis* in *Opheodrys* and the union of *Potamophis* and *Virginia* under the name *Haldea.*

Typographical errors are much fewer than in the third edition. The use of parentheses for authorities is more consistent than in the third, although we prefer Dr. Osgood's suggestion to drop them altogether rather than to extend their use to subspecific changes. This divergence from the rules is certainly more useful and no greater than the dropping of hyphens from *Dipsosaurus, quadramaculatus, guttolineatus,* etc. with which we are in entire sympathy. The only specific criticism not purely one of personal opinion is that all names dropped from the previous edition be included in the synonomies of the current edition. — Walter L. Necker